HAYDITE

The Original Lightweight Aggregate

Structural Concrete

Refractory Concrete

Precast Concrete Products

Acoustical Concrete

HAYDITE MANUFACTURERS

(For List of Licensed Manufacturers See Back Cover)

HAYDITE GOES TO WAR!

Concrete Barges at Outfitting Piers, Belair Shipyard

Light, Strong, Durable, Fireproof, Low Absorption, Insulating

WHAT IT IS—Haydite is an artificial lightweight aggregate produced by expansively burning shale or clay under a patented manufacturing process.

WHAT IT ACCOMPLISHES—By the use of Haydite aggregate, concrete fully one-third lighter in weight than natural aggregate (sand, crushed stone and/or gravel) concrete can be produced. Haydite aggregate concrete also has other physical properties such as fireproofing and behavior under severe atmospheric conditions superior to natural aggregate concrete.

HOW IT IS MADE—Haydite is produced from the same raw material (clay or shale) as used for the manufacture of high grade brick. After being taken from the bank or quarry, the raw material is reduced to a proper fineness, and then introduced into a rotary kiln of substantially the same type as used for the manufacture of Portland cement. Here the material is expansively burned at a temperature in excess of 2000° F. and discharged from the kiln in the form of clinker. The clinker is allowed to cool and is then crushed, screened and graded to the various aggregate sizes.

PHYSICAL PROPERTIES—The process produces an inert, lightweight material of cellular structure. The expansion is so complete that even the finest particles of the burned material are composed of a series of tiny air cells, the partitions of which are vitrified, showing an ideal cellular structure when magnified. Its cellular nature makes it one of the best heat and sound insulating materials. Having been burned at a temperature in excess of 2000° it has no combustible content and is chemically inert. Haydite aggregate fully meets the specification requirements for natural aggregates in the freezing and thawing durability test and the sodium sulphate soundness test.

ASSURED UNIFORMITY—The entire manufacturing process of Haydite, from raw material to screening and grading of the aggregate ready to ship, is under perfect control, assuring a product that is absolutely uniform at all times.

The Haydite aggregates produced at the various plants (see list on back cover) are similar in their general characteristics, with variable weights, (refer to Page 5) color and chemical composition. The aggregates from all the plants produce a concrete with the same general properties.

TIME TESTED—Haydite aggregate has been used extensively during the last *twenty years* in all forms of monolithic concrete. Light weight, economy of manufacture and other desirable qualities make it the outstanding material for the production of concrete products. Its use in this latter field has expanded rapidly during the last ten years.

TESTS AND TEST DATA—Since the beginning of commercial production in 1920, several million cubic yards of Haydite aggregate have been produced and used in monolithic concrete and concrete masonry products. Extensive tests have been carried on continuously over this period by joint groups of the producers and by the patent right owner. Additional tests have been conducted by the Western Brick Company at its Danville laboratory and through a scholarship at the University of Illinois; The Hydraulic-Press Brick Company at its South Park laboratory, and the Ohio State University. Other manufacturers have conducted hundreds of tests through commercial laboratories.

The Haydite Manufacturers have sponsored experimental work on Haydite aggregates at Armour Institute, the University of Michigan, the U. S. Bureau of Public Roads and the U. S. Bureau of Standards.

Under the auspices of the American Aggregate Company experimental work has been carried on in commercial laboratories, at the University of Wyoming and at the University of Wisconsin. In the tests at the University of Wisconsin the American Aggregate Company was a contributor in the tests of concrete masonry units (A.C.I., Nov. 1939).

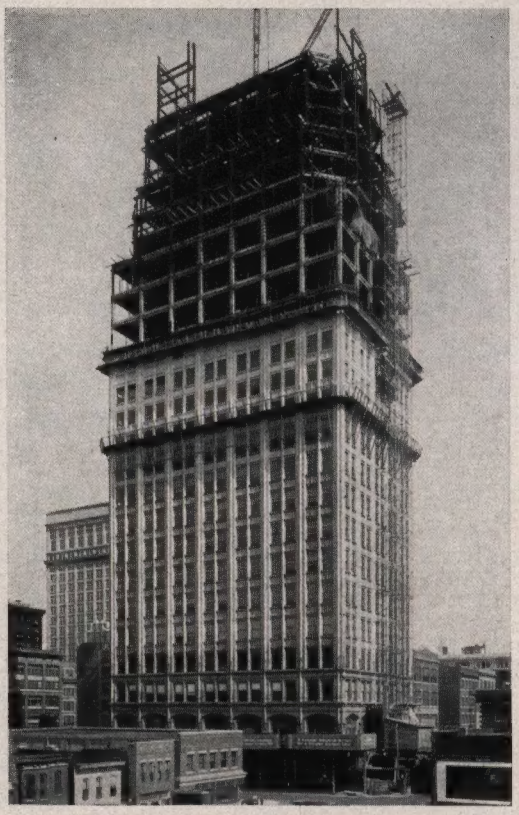
The Haydite industry has maintained constant observance of their many structures, and has available performance records of Haydite concrete, under the most severe conditions, for a continuous period of eighteen years. **All test data is available on request.**

Coarse size of Haydite enlarged to show cellular structure

Broad Adaptability — Uses

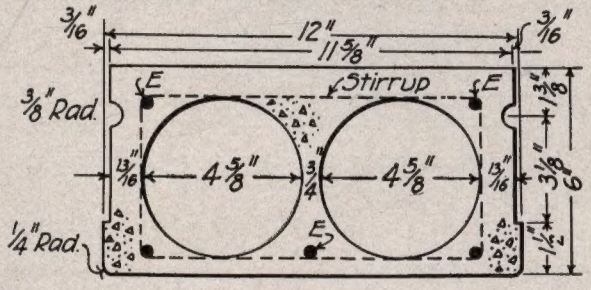
HAYDITE

STRUCTURAL CONCRETE



Fourteen stories added by use of Haydite Concrete and Units

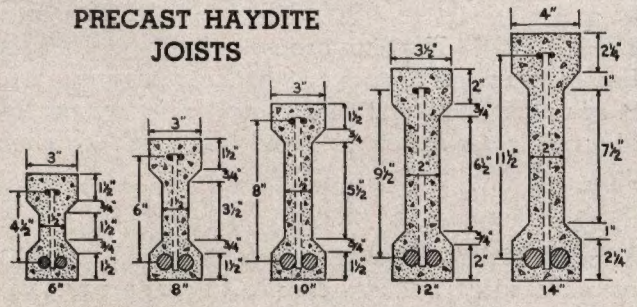
PRECAST FLOOR UNITS



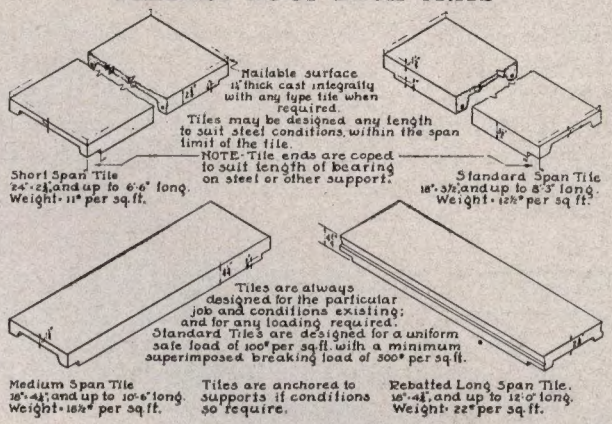
CROSS SECTION

P-B Floor and Roof Units are readily cut to fit the job by means of ordinary tools. Unlike other precast floors the job need not be previously laid out. Neither are special shapes required.

PRECAST HAYDITE JOISTS



PRECAST ROOF DECK UNITS

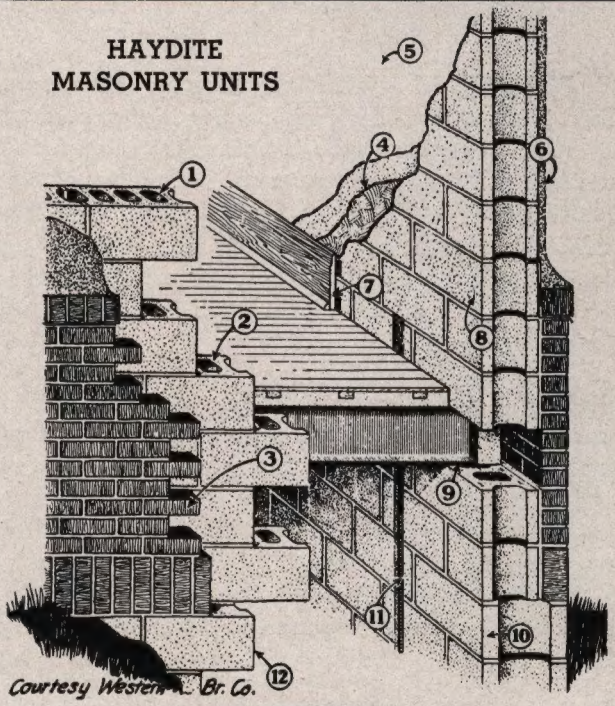


All tiles are fully reinforced with proper sizes of deformed steel bars in legs, and Electric welded galvanized iron wire mesh in webs.

Extra long span tile, 20 ft. 7 in., and up to 22 ft. 0 in. long are available. Weight 30 lbs. per sq. ft.

Tiles with vertical sides are pointed with mastic. Rebatted tiles are grouted with Haydite mortar, in which may be imbedded steel ties or sleeper clips.

HAYDITE MASONRY UNITS



Courtesy Western ... Br. Co.

ADVANTAGES

1. Large, lightweight units cut dead loads and save labor costs.
2. Highly rated for fire-safety. Haydite has no combustible content.
3. Ideal back-up for face brick, stone and other facing materials.
4. Splendid plaster base. Saves furring, lathing, plaster and labor.
5. Danger of plaster cracks and blemishes reduced to minimum.
6. Stucco applied directly to units.
7. Trim nailed directly to units saves nailing plugs and strips.
8. Effective sound and heat insulation without extra cost.
9. Load bearing strength fully meets local building codes.
10. Limited capillarity assures dry interior wall surfaces.
11. Units are cut and channelled easily without danger of breakage.
12. Units are true and absolutely uniform in all properties.

Physical Properties

LIGHT WEIGHT—Haydite concrete weighs from 60 to 90 pounds per cubic foot depending upon the strength of the mix—whether for structural or merely fill purposes. Thus Haydite is from thirty to forty per cent lighter than ordinary concrete. This light weight results in less dead load reflected in considerable savings in the cost of foundations, reinforcement and steel in fireproof buildings.

STRUCTURAL STRENGTH—The light weight of Haydite concrete in no way affects its structural strength. Any strength of concrete is obtainable with the proper cement factor as demonstrated in the tables on the opposite page. Haydite aggregate is not porous, but is composed of small, vitreous, non-connecting cells. For this reason none of the cement paste is lost in filling voids in the aggregate particles, thus making all of the cement effective in producing good workability of the mix and higher structural strength in the finished concrete.

FIRE RESISTANCE—Since the Haydite aggregate clinker is produced by temperatures in excess of 2000° F. it is entirely free of combustible matter and is unaffected by high temperatures. Due to its cellular structure when used in the usual thicknesses surrounding structural steel it is much more efficient as protective fireproofing than ordinary concrete, with the added advantage of light weight.

DURABILITY—Haydite concrete has been subjected by authoritative testing laboratories to 100 cycles of alternate freezing and thawing demonstrating little or no effect to extreme temperature changes. This attribute has been well demonstrated over a period of many years where both Haydite monolithic concrete and Haydite blocks have been exposed to the elements in cold climates exposed to repeated freezing and thawing.

ABSORPTION—Composed of series of tiny, non-connecting air cells, the partitions of which are thoroughly vitrified, Haydite concrete has low capillarity and in the proper mixes is practically impermeable to moisture.

HEAT TRANSMISSION—Depending on the mix and its use, structural or fill, the thermal conductivity varies from 1.80 B.t.u. per sq. ft., per inch thickness to 3.98 B.t.u. per sq. ft., per inch thickness. The light cellular structure of Haydite is in itself an ideal insulating medium. See also page 7.

SOUND TRANSMISSION—A majority of the tests conducted to determine the sound insulation properties of Haydite building units have been conducted by Dr. Paul E. Sabine of the Riverbank Laboratories, Geneva, Illinois. Regarding these tests Dr. Sabine states:

> "Haydite partition units show the greatest number of sensation units in sound reduction of the five leading types of partition materials such as hollow clay, gypsum tile, plaster on metal lath, and plaster on wood lath and wood studs; conversation speech can be faintly heard but not understood and the sound of a phonograph is almost completely extinguished through the Haydite partitions."

SOUND ABSORPTION—Walls of Haydite building units exposed (unpainted) have excellent sound absorption qualities. The coefficient of sound absorption at pitch 512 is .37. See also page 6.

NAILABILITY—A substantial economy in construction, using Haydite masonry units, results from the fact that wood trim, furring, etc., can be nailed directly to the units. Nails driven into the block will not loosen and there is no danger of rusting of the nails.

BOND—The ratio of bond resistance to compressive strength at 28-day age is essentially the same as for like mixes of natural aggregate concrete. Haydite aggregate has a coefficient of expansion comparable to that of Portland cement. Thus when combined with Portland cement to produce concrete, it creates a perfect and permanent bond between the cement and aggregate.

CHEMICALLY INERT—Haydite aggregate contains no ingredients that will cause disintegration of concrete. It affords the very best protection to reinforcement. Entirely free of silt, sulphur and other impurities which are injurious to metals. Metal piping, conduits, etc. may be safely embedded in Haydite fills.

REFRACTION—Haydite concrete has excellent refractory qualities for use in temperatures up to 2000° F. or more. Its insulation is comparable to materials of much lower structural value and much higher in cost.

SPARK-PROOF—Haydite aggregate, used with the proper binder, produces excellent spark-proof floors, strong and durable.

Concrete Design Data

Data for this page furnished by The Hydraulic-Press Brick Company pertains to Haydite manufactured at their (Cleveland) South Park, Ohio, Plant. Haydite from other plants will vary as to weights, etc.

TOLERANCES FOR VARIOUS GRADINGS OF HAYDITE AGGREGATE (All % Coarser Retained)	Sieve Size	Grade A Total % Retained	Grade B Total % Retained	Grade BX Total % Retained	Grade C Total % Retained
	½	.....	.....	.....	10- 25
	⅜	.....	0- 10	.....	60- 80
	4	.....	65- 75	5-15	90-100
	8	2-12	90-100	30-45	100
	14	25-40	.....	60-70	100
	28	50-70	.....	77-84	100
	48	70-85	.....	85-90	100
	100	80-90	.....	90-95	100
	F.M.	2.27-2.97	5.55-5.85	3.47-3.99	6.60-7.50

DATA ON HAYDITE STRUCTURAL CONCRETE

Weight of aggregate 1500 to 1600 pounds per cubic yard. Mixes to be made by loose volume, calculating 1 sack cement as 1 cubic foot. Recommend pre-wetting aggregate in advance of mixing. Moisture in excess of 7 per cent by weight will be effective as mixing water. The total water content indicated below gives best yield, insulation, and strength. Structural concrete placed by vibration method permits lower water content with corresponding strength increase according to water-cement ratio curves.

Mix	TOTAL Mixing Water Gallons Per Sack Cement	Sacks of Cement Per Cu. Yd.	"BX" Size HAYDITE Yield	WEIGHT Pounds Per Cu. Ft.	COMPRESSIVE STRENGTH Pound Per Sq. In. of A.S.T.M. Standard 6 x 12-in. Cylinders	
					7 Days	28 Days
1-3	5.5	9.0	1.00	102	2400	4000+
1-3½	6.0	8.0	1.05	101	2100	3500+
1-4	7.0	7.0	1.10	100	1800	3000+
1-5	8.0	6.0	1.10	98	1500	2500+

DATA ON HAYDITE FLOOR AND ROOF FILLS

Data on Haydite floor and roof fills with high insulating value thermal conductivity, 1.62 to 2.02 B.t.u. per hour per square foot per inch thick per degree differential, depending upon densities as below.

Mix	TOTAL Mixing Water Gallons Per Sack Cement	Sacks of Cement Per Cu. Yd.	"BX" Size HAYDITE Yield	WEIGHT Pounds Per Cu. Ft.	COMPRESSIVE STRENGTH Pounds Per Sq. In. of A.S.T.M. Standard 6 x 12-in. Cylinders	
					7 Days	28 Days
1-6	5.5	4.5	1.00	80	700	1200
1-8	7.0	3.5	1.03	78	600	1000
1-10	8.5	2.9	1.06	75	450	800
1-12	10.0	2.4	1.07	74	300	600
1-13.5	12.5	2.0	1.10	73	200	400

DATA ON HAYDITE MORTAR AND FLOOR TOPPING

Materials required for one cubic yard of Haydite mortar or floor topping "AA" size aggregate. (Sand size.)

Mix	Sacks Cement	CUBIC YARDS "A" HAYDITE		Mix	Sacks Cement	CUBIC YARDS "A" HAYDITE	
		Dry Rodded	Loose Damp			Dry Rodded	Loose Damp
1-1	15.15	0.56	0.65	1-2½	9.15	0.85	0.98
1-1½	12.45	0.69	0.80	1-3	8.09	8.09	1.03
1-2	10.55	0.78	0.91	1-4	6.55	0.97	1.12

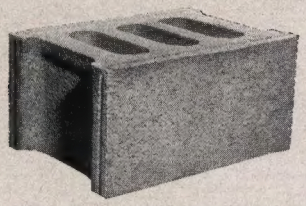
Haydite mortar and floor topping—average tensile strengths of 1-3 mortar.

"AA" SIZE HAYDITE			STANDARD OTTAWA SAND		
7 Day	14 Day	28 Day	7 Day	14 Day	28 Day
412 lbs.	485 lbs.	532 lbs.	318 lbs.	390 lbs.	415 lbs.

Haydite aggregate contains no combustible material, and is so free of silt, sulphur and other impurities which are injurious to metals, that pipes, conduits, etc. may be embedded in the Haydite concrete without danger of corrosion.

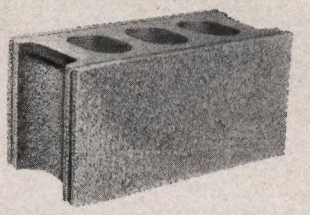
Precast Wall Units

DIMENSIONS OF HAYDITE BUILDING UNITS



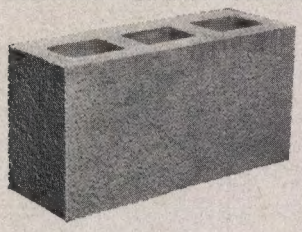
12-in. Standard Haydite Unit

Nominal size—12" x 8" x 16";
Actual size—12" x 7¾" x 15¾".



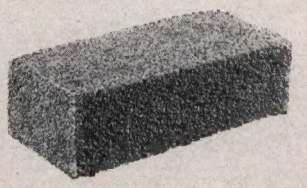
8-in. Standard Haydite Unit

Nominal size—8" x 8" x 16";
Actual size—8" x 7¾" x 15¾".



4-in. Standard Haydite Unit

Nominal size—4" x 8" x 16";
Actual size—3¾" x 7¾" x 15¾".



Haydite Brick

Actual size—2¼" x 3¾" x 8".

COMPARISON OF WEIGHTS

The light weight of the Haydite Building Unit in connection with its other qualities is one of its most striking merits. A standard 8 x 8 x 16-in. lightweight Haydite Building Unit weighs 25 to 28 lbs., as compared with 45 to 50 lbs. for an ordinary concrete block of the same size. It displaces in the wall 2.1 hollow clay tile (5" x 8" x 12") weighing approximately 32 lbs., or 12 common brick weighing about 60 lbs.

A comparison of weights of these units plus the weight of mortar required for 100 square feet of 8-in. wall shows the following results:

8 x 8 x 16-in. lightweight Haydite Building Units plus ½-in. mortar joints—3633 lbs.

Hollow clay tile (5" x 8" x 12") plus ½-in. mortar joints—4410 lbs.

Ordinary concrete blocks (8" x 8" x 16") plus ½-in. mortar joints—5975 lbs.

Common clay brick (8" x 2¼" x 4") plus ½-in. mortar joints—9100 lbs.

Modern construction involves the ever-increasing use of materials that are resistive to fire, reduce heat losses through walls to a minimum, and provide privacy by the maximum elimination of sound transmission through walls against outside noises.

Haydite Building Units incorporate all these factors and are offered as an ideal lightweight back-up and partition material for all types of building construction.

FIRE RESISTANCE

Official report, known as Retardant No. 2309, by the National Board of Fire Underwriters, summarizes as follows:

"The tests and examinations reported herein indicate that Haydite Building Units, 8" x 8" x 16", made in accordance with the specifications contained in this report, when assembled into walls 8-in. thick and with the usual limitations of height and unbraced area, may be classified as three-hour load-bearing walls."

The above test was made on units manufactured for standard commercial construction.

Slight alterations in proportions and design will produce units of even better fire resistance.

TRANSMISSION OF SOUND BY WALLS

From Tests by Paul E. Sabine, Ph.D., of Riverbank Laboratories, Geneva, Ill.

Type of Construction Tested	Weight Per Sq. Ft.	*Average Reduction 128-4096	*Average Reduction 128-1024
3-in. Solid Gypsum Tile and 1¼-in. Gypsum Plaster	25.4	34.3	32.6
3-in. Hollow Gypsum Tile, Unplastered	11.1	24.0	22.3
4-in. Clay Tile and ½-in. Gypsum Plaster	22.0	32.0	30.8
4-in. Clay Tile and 1-in. Gypsum Plaster	27.0	35.0	33.6
2½-in. Gypsum Plaster on Metal Lath	23.2	33.3	30.5
3½-in. Gypsum Plaster on Metal Lath	32.5	36.1	34.3
2 x 4-in. Wood Stud, Wood Lath, Plastered	18.0	29.4	28.0
4-in. Haydite Partition Unit and 1-in. Gypsum Plaster	23.2	38.0	36.1
8-in. Haydite Building Unit and 1-in. Gypsum Plaster	43.5	40.1	37.2

*The "Average Reduction Values" are in "Sound Sensation Units" and are taken as the Measure of their Relative Sound Insulating Merits.

ARCHITECTURAL ACOUSTICS

From Tests by Paul E. Sabine, Ph.D., of Riverbank Laboratories, Geneva, Ill.

Material Tested	Pitch					
	128	256	512	1024	2048	4096
	Absorption Coefficients					
Plaster, Gypsum on Wood Lath, Wood Studs, Rough Finish	.016	.032	.039	.030	.030	.028
Plaster, Same as Above, Except Smooth Finish	.020	.022	.032	.038	.039	.028
Balsam Wool, Soft Wood Fiber, Paper Backing, Scrim Facing, 1-in. Thick 0.254 lbs. per Sq. Ft.	.10	.27	.50	.68	.56	.48
Flax-Linum, Semi-Stiff Fiber Board ½-in. Thick	.09	.15	.34	.57	.51	.47
Draperies, Hung Straight in Contact with Wall, Cotton Fabric 10 Oz. per Sq. Yd.	.03	.04	.11	.17	.24	.35
Draperies, Same as Above, Velour, 18 Oz. per Sq. Yd.	.05	.12	.35	.45	.38	.36
Draperies, Velour, 18 Oz., Hung 4 in. from Wall	.06	.27	.44	.50	.40	.35
Haydite Building Units, Natural Condition, Unpainted	.18	.34	.37	.33	.37	.26

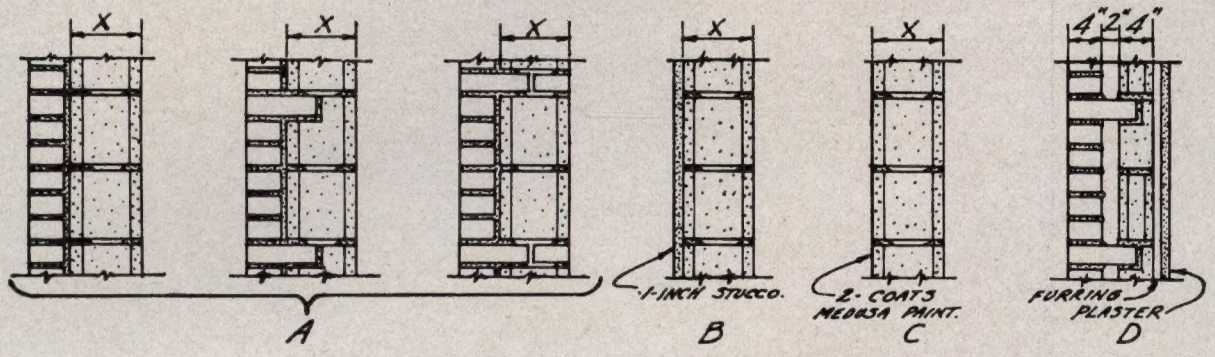
Wall Unit Test Data

HEAT CONDUCTIVITY

Authority for Conductance Values of Haydite Units and Conductivity Values of Haydite Concrete are Taken from Test Conducted by J. C. Peebles, Armour Institute of Technology Reported April 1, 1931. For authority for Values "C" and "K," Refer to 1935 Publication of A. S. H. V. E. Guide.

Conductances and Conductivities of Various Materials B.t.u. per Sq. Ft. per Hour per Degree Fahrenheit Difference, Conductance per Unit Thickness and Conductivity per 1 Inch in Thickness

Material	Conductance	Material	Conductivity
8-in. Haydite Units	C-0.30	Haydite Structural Concrete	K-3.98
4-in. Haydite Units	C-0.66	Haydite Insulating Fill	K-1.80 to K-2.07
8-in. Clay Tile (2 cell)	C-0.60	Stone Concrete	K-12.00
4-in. Clay Tile	C-1.00	Cement Mortar	K-12.00
8-in. Concrete Block	C-1.00	Face Brick	K- 9.20
Wood Lath and Plaster Total Thickness ¾"	C-2.50	Common Brick	K- 5.00
Air Space ½ in. or more	C-1.10	Stone (Sandstone, Limestone)	K-12.50
fo Outside Coefficient	6.00	Stucco	K-12.00
fi Inside Coefficient	1.65	Gypsum Plaster	K- 3.30



Insulating Value of Various Types of Masonry Walls

Rating as to Value of U. on Walls or Insulating Value	Description of Combination of Materials Used in Walls and Value of U		First X = 8-in. Haydite Value U.	Second X = 8-in. Clay Tile Value U.	Third X = 8-in. Brick Value U.	Fourth X = 8-in. Concrete Value U.
1-A	4-in. Brick, 8-in. Backup, No Interior Finish	U =	.220	.340	.360	.440
2-A	4-in. Brick, 8-in. Backup, ½-in. Plaster Direct	U =	.213	.330	.340	.420
3-A	4-in. Brick, 8-in. Backup, Furred, ¾-in. Wood Lath and Plaster	U =	.171	.240	.240	.280
1-B	8-in. Wall, 1-in. Stucco Exterior, No Interior Finish	U =	.239	.400	.478	.539
2-B	8-in. Wall, 1-in. Stucco Exterior, ½-in. Plaster Direct Interior	U =	.230	.370	.446	.500
3-B	8-in. Wall, 1-in. Stucco Exterior Furred, ¾-in. Wood Lath and Plaster	U =	.182	.260	.294	.316
1-C	8-in. Wall, 2 Coats Medusa Paint Exterior, No Interior Finish	U =	.243	.409	.500	.560
2-C	8-in. Wall, 2 Coats Medusa Paint Exterior, ½-in. Plaster Direct	U =	.235	.385	.460	.520
3-C	8-in. Wall, 2 Coats Medusa Paint Exterior, Furred, ¾-in. Wood Lath and Plaster	U =	.185	.266	.300	.320
D	10-in. Wall Using 4-in. Brick Exterior, 2-in. Air Space and 4-in. Backup of Various Materials		4" Brick 4" Haydite	4" Brick 4" Tile	4" Brick 4" Comb.	4" Brick 4" Conc.
1-D	10-in. Plain Wall, No Interior Finish. 2-in. Air Space	U =	.277	.321	.343	.408
2-D	4-in. Brick, 2-in. Air Space, 4-in. Backup, Furred, ¾-in. Wood Lath and Plaster	U =	.202	.226	.237	.266

U = B.t.u. Conducted Through One Sq. Ft. of Wall per Hour per 1° Difference

Various Types of Commonly Used Wood Frame Construction

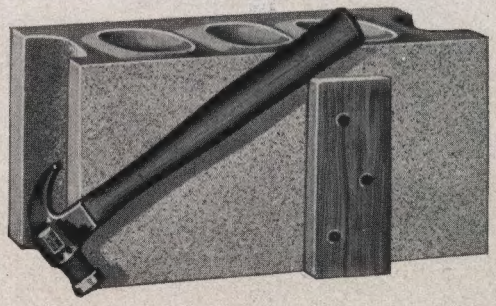
Type of Construction	Wall Conductance	
Wood Siding, Paper, 1-in. Sheathing, 2 x 4 Studs, Wood Lath, ½-in. Plaster	U =	.250
Shingles, Paper, 1-in. Sheathing, 2 x 4 Studs, Wood Lath, ½-in. Plaster	U =	.250
1-in. Stucco, Paper, 1-in. Sheathing, 2 x 4 Studs, Wood Lath, ½-in. Plaster	U =	.300
4-in. Brick Veneer, Paper, 1-in. Sheathing, 2 x 4 Studs, Wood Lath, ½-in. Plaster	U =	.270

Nailability

One of the outstanding features in the use of Haydite Precast Wall Units is that they are "Nailable." Not only do nails penetrate easily under ordinary hammer blows, but they hold firmly.

Authentic tests conducted show that to pull 6-penny nails driven through a 1¼-in. board into Haydite Precast Wall Units required from 100- to 165-pound pull to extract the nails.

Thus, wood trim, furring, pipe and conduit supports can be nailed directly to the units—wood soldiers, wall plugs and expansion bolts are unnecessary.



HAYDITE

The Original Lightweight Aggregate

Structural Concrete

Refractory Concrete

Precast Concrete Products

Acoustical Concrete

HAYDITE MANUFACTURERS

Licensed Manufacturers of Haydite Aggregate

Carter-Waters Corporation	Kansas City, Missouri
Hydraulic-Press Brick Co.	St. Louis, Missouri
Hydraulic-Press Brick Co.	South Park, Ohio
Western Brick Co.	Danville, Illinois
John H. Black Co.	Buffalo, New York
McNear Co.	San Rafael, California
Cooksville Co. Ltd.	Toronto, Ontario, Canada
Washington Haydite and Concrete Products Co.	Bothell, Washington

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